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EDITORIAL CHAT.

In the demise of Dr. Orton the University has lost one of her strongest and best loved instructors and supporters, and the scientific world one of its brightest lights, and more than this, all who knew him lose a true friend who was always interested in their welfare. Those who are able to do so will speak of his attainments. We wish to remember him as we knew him, a loving, inspiring friend and teacher, a faithful and untiring worker, for "he was a man who counted naught as alien to himself which was of interest to mankind." He was a lover of nature in all her forms, but especially did he love to trace the history of nature as it is truly and unmistakably recorded in the rocks around us.

Those of us who have had the privilege of standing with him in some rocky gorge as he read to us a part of this history from the book of nature itself, can realize, only in part what we owe to him and what we have lost. His words of praise, his kind and gentle reproofs stirred the soul with a determination to be more worthy of itself and its Maker. His life was an example of what living really meant and he taught us to feel something of what he himself felt when he said "I have a growing respect and reverence for man. The

spiritual difference between him and the rest of creation seem infinite. A being of such unmistakable alliance with Divinity as man, with the Godlike endowments of reason and conscience, may hope to emerge even from the shock of death unharmed."

November 13th the State and National Grange meet in convention at Springfield, and among other elaborate plans for the meeting, arrangements have been made for a free excursion to Columbus, accommodating eight hundred persons. The object of this trip is to visit and inspect the University, and especially the Department of Agriculture. The visitors will leave the train at the Fair Grounds and take the street cars there direct to the University. Some complaints have been heard from the ranks of the Grangers that agriculture was being neglected and crowded out by the other courses at the University; now they are literally going to take us by storm, and see for themselves if this be true. We are glad of this and take this opportunity to welcome the Grangers upon the campus for, being wide awake to the needs of an education in agriculture, we are sure that this visit will convince them that nowhere else can their children be better educated for scientific practical life on the farm.

News Items.

"Woven Wire Fences" was the subject of a very interesting and instructive lecture before the class in Farm Equipment, on October 4, by Mr. R. C. Kyle, President and Manager of the Jones National Fence Company.

On the evening of October 11, Mr. Luke generously opened the green house to any who wished to see the beautiful flowers of the night blooming cactus (*Phycactus latifrons*). This plant is a native of Mexico and is grown only in green houses in this latitude. The plant itself gives little promise of anything beautiful, but the large, snowy white, waxen flowers are among the most fragrant and beautiful that we have ever seen, and a large number thank Mr. Luke for the privilege of seeing these rare flowers.

The secretary of Agriculture has planned "a publication which shall contain a resume of the achievements of the United States in every brand of science as related to agriculture during the nineteenth century, for distribution at the Paris Exposition." Each of the Bureau divisions charged with scientific work have been directed to contribute one or more articles reviewing the application to agriculture of the science with which it is concerned. The division of forestry intends to contribute a short history of forestry in the United States, and also an account of the efforts of private land owners to apply the principles of forestry. The Division solicits correspondence regarding every such effort in order to make a proper showing of the extent of this work.—*Botanical Gazette*.

We are indebted to the Columbus Evening Dispatch, for the excellent frontispiece of Dr. Orton.

The Asparagus Club.

The club has been holding its regular weekly meetings on Tuesday evening in Horticultural Hall with good attendance and interesting programs. The Club now has a room of its own and a movement is on foot to refurnish it. About thirty of the exchanges of the Columbus Horticultural Society are kept on file in the room, and an effort is being made to found a horticultural library for the use of the members. The meetings are informal and the Club has no officers but appoints its temporary chairman for each meeting. Visitors are always welcome.

The Columbus Horticultural Society.

Held its October meeting Saturday, the 28, at 2 P. M. in Horticultural Hall. The following program was rendered:

Fruit: Some of the Climatic Features and Effects of 1899. Geo. W. Gill.

Pear culture and Report on Season Crop, H. Warren Phelps.

Plants at the Ohio Experiment Station, Prof. W. J. Green.

Structural Features of the Apple, Prof. William R. Lazenby.

Reports were also given on the season's fruit crop by: Nelson Cox, F. P. Dill, Samuel Taylor, L. K. Sutton, F. Rieble and Wm. Miller.

The Ohio Dairy Exhibit.

The Ohio State Dairyman's Association appointed a committee of three to arrange for an exhibit of dairy products at its next meeting which will be held in February at Townshend Hall, Ohio State University, Columbus, Ohio. The committee consists of Prof. Thomas F. Hunt, Ohio State University, Columbus; Eldon P. Smith, of the firm of W B Smith & Son, Columbus, and F. M. Wilson, Salem, Clark County. This committee has ar-

ranged for cash premiums on best 60 lb. tub of butter; on best five one pound prints of butter; on best full cream American cheese, cheddar, flats or young Americas, and on best Swiss cheese. A special premium of a Jersey calf of either sex has also been offered for the best five one pound prints of butter made upon the farm, the product of one herd, and it is expected that other special premiums may be offered. Space has been provided for an exhibit of dairy apparatus and supplies, while machinery and apparatus of the Dairy School will form a part of such exhibit.

Draft Test of Plow.

The accompanying table is compiled from experiments made by the students in the class in Farm Equipment, October, 1899, upon the draft of a plow, using a dynamometer. These experiments were made in a field of clay loam first bottom land, practically free from stones, and had been sown to barley and peas for fall forage, but owing to unfavorable weather the crop was quite light.

No.	Furrow.		Draft.	Draft per sq. in. of furrow slices.
	Width.	Depth.		
1	11½ in.	5 in.	500 lbs.	8.69 lbs.
2	15 " "	8 " "	700 " "	5.83 " "
3	12½ " "	11 " "	850 " "	6.18 " "
4	13 " "	8 " "	650 " "	6.25 " "
5	13½ " "	8½ " "	700 " "	6.1 " "

Noticing carefully the above table, we see that No. 1 had the greatest draft per sq. in., yet the lightest draft upon the team.

No beam wheel was used, but in No. 4 a cutter was attached making the draft per sq. in. somewhat greater than in Nos. 2, 3 or 5. No. 4 with cutter and running ½ in. shallower and ½ in. narrower than No. 5 (without cutter), had a draft of nearly ¼ lb. per sq. in. more.

Nos. 2 and 5 have same draft, and nearly same draft per sq. in., although the small difference favors the shallow plowing. The plow used was a new 12½ inch Oliver Chilled walking plow.

C. A. MINER.

Rural School Grounds.

Great interest has of late years been manifested in our public schools in what is called "Nature Study"—the things of beauty and interest that do or may surround every child in the country also in the improvement of our rural schools themselves either by the plan of centralization often explained in these columns, or by creating local interest and enthusiasm in the improvement of country district schools and their surroundings. Nothing can more strongly encourage the study of nature than earnest local effort to beautify and improve the school grounds and lawns, by trees, vines, shrubbery and flowers. To encourage just such improvement we offer.

TWO PRIZES.

First Prize \$50. Second Prize \$25.

These prizes are offered to the two country districts in any state of the Union which shall show the greatest improvement in its school buildings, outbuildings, grounds shrubbery, etc., in any 13 months between July 1, 1899, and November 1, 1900. The improvements made must be plainly shown by at least two clear photographic views, not smaller than 3x4 inches, of buildings and grounds, one taken in 1899 and the other in 1900 and not more than 13 months apart in time. Also by a correct plan or diagram and full description of the school grounds, buildings, walks, trees, shrubs, flower beds, etc.

Our design has been to make the prizes so liberal as to justify the employment, if necessary, of a person of taste and ability or the purchase of suitable books to suggest plans for the grounds and suitable trees, shrubs and flowers to be used. Also to interest the parents in the work and the pupils in nature

study hereafter. Also to secure and publish landscape plans that shall be a help in other districts in the future.

Notice of intention to compete, with photograph of condition of buildings and grounds when the improvements begin, must be received at this office not later than November 1, 1899, and the final photographs, plans and descriptions (including methods used to create interest) must be in by November 1, 1900.

The picture is a vivid one in the minds of the most mature men and women born in the country—of the dilapidated country school house on the hill, its broken fences, tangled weeds, staring and immodest outhouses, and cheerless, treeless landscape.. Let us hope that picture may henceforth be wholly of the past. That hope it is which inspires the above premiums, which it has long been in our minds to offer. Bulletin 16, January 1899, issued by the Cornell University experiment station, has come to our notice since we decided to make the offer. It is entitled "Hints on rural school grounds." We advise all who intend to compete for the prizes or to improve their school grounds, to send to L. H. Bailey, Ithaca, N. Y., for the Bulletin to aid them in the work by its most excellent suggestions and illustrations.—Ohio Farmer.

Prof. John W. Decker

John W. Decker, Madison, Wis., has been elected Associate Professor of Dairying in the Ohio State University and enters upon his duties as head of the work of the Dairy School on December 1.

Professor Decker was born at Neenah, Wisconsin, July 10, 1867. He lived at Winneconne six years and then moved to Fond du Lac, where he studied in the public schools. In 1885 he built a cheese

factory near Fond du Lac and operated it for two years. In the fall of 1885 he exhibited cheese at the Chicago Fat Stock and Dairy Show winning the Potter Palmer and other prizes. He entered the University of Wisconsin in the fall of 1886. During his junior year, he was appointed instructor in the biological laboratory where he spent about twenty hours per week, at the same time carrying on his studies. He graduated from the agricultural course taking the degree of B. Ag. with the class of 1890. He was elected Fellow in Agriculture which position he held for one year when he was elected Instructor in Dairying. During the summer of 1890, he visited the cheese factories of Canada as a special agent of the Wisconsin Dairyman's Association. In 1891, he exhibited cheese at the Wisconsin Dairyman's Convention winning the silver cup and other prizes. He has been with the Wisconsin Dairy School since it was organized, and in that time has given instruction to over 900 students who are now scattered all over the United States and Canada.

His duties as instructor in cheese making have given him an extensive acquaintance and experience in this line of work. The results of his investigations have been published in the Annual Reports of the Wisconsin Experiment Station. The Wisconsin Curd Test, which he has aided in introducing into the cheese factories of Wisconsin, is now considered by the cheese makers to be nearly indispensable.

The Dairy School of the Ohio State University with its magnificent equipment and its large corps of instructors is an institution which Ohioans may feel a just pride and this recent move on the part of the Board of Trustees will result no doubt in greatly increased usefulness.



PROF. JOHN W. DECKER.

Death of Dr. Orton.—His Life.

Upon Monday afternoon, October 16, the University was shocked and saddened by the news of Dr. Orton's death, and it was with difficulty that faculty and students slowly realized that he whom all loved and honored, would be seen no more among us forever.

It is doubtful whether the news of any other man's death would have brought equal sorrow. His sympathies were as wide and generous as the reach of his intellectual life, and won for him the univer-

sal affection of colleagues, pupils and citizens. No man in public or private life has deserved better of the state and the institution with which he was so long connected, than did this gracious and unassuming scholar whose seventy years of life have ended.

To attempt to eulogize him would be "deeds done in the body" have reared for but mockery. He needs no eulogy. The him a monument in the hearts of his fellow men which time cannot raze in the dust. In him was combined the phil-

osopher, scholar, man. As teacher, lecturer and scientist he distinguished himself from his fellow men without falling victim to the pride which too often goes with greatness.

Edward Orton was born in Deposit, Delaware County, New York, March 9, 1829. His father was born at Litchfield, Conn., graduated from Hamilton College in 1822, and for over half a century was a minister in the Presbyterian church in western New York. The boyhood days of Edward were spent on the farm where he formed that love of the earth which has been the guiding influence of his life. He attended the Westheld and Fredonia, New York, academies one year each, and entered Hamilton College as a sophomore in 1845, graduating with the class of 1848. The following year he entered the Lane Theological Seminary at Cincinnati, where he studied under Lyman Beecher. In 1852 he began a six months course of study in the Lawrence Scientific School of Harvard University, and in 1854 began a years' study at Andover Theological Seminary. In 1856 he was called to the chair of Natural Science at Albany, N. Y., which position he held until 1859 when he resigned to take charge of the Chester Academy at Chester, N. Y. After six years of service here, he accepted the principalship of the preparatory department of Antioch College in Ohio. He was soon elected professor of Natural Sciences and in 1872 President of the Antioch College.

In 1873 he came to Columbus as the first President of Ohio State University; then called the Ohio Agricultural and Mechanical College, and the success of this institution is due in a great measure to his ability and untiring efforts in its behalf. In 1881 he resigned the presidency, still retaining the chair of geology. In 1882 he was appointed State Geologist

by Governor Foster, and he has been re-appointed by each succeeding governor, and held the position at the time of his death.

The numerous geological reports and bulletins of which he was author are already considered authority on the subjects treated and are constantly consulted by every thorough student.

Dr. Orton has been honored by membership and office in various scientific societies, but, perhaps the crowning honor of his life was his election to the presidency of the American Association for the Advancement of Science whose recent meeting in Columbus is still fresh in our minds.

At two o'clock Wednesday afternoon, after a short private service at the home of the deceased, services were held at the First Congregational Church, Dr. Gladden preaching the funeral.

ACTION OF FACULTY.

The following resolutions in memory of Dr. Orton were unanimously adopted by the Faculty:

Our associate, Edward Orton, Ph. D., LL. D., the first president of the university having died yesterday afternoon at his home in this city, the general faculty do therefore place on record this appreciation of his life and character and their deep sense of loss in his death.

As the head of the Faculty during the first eight years of its history, he impressed on the University a character and imparted to it an impulse which remains to the present day. His distinguished attainments in scientific and general scholarship, his clear intellectual perceptions, his unflinching tact, his high standards of work, his exalted sense of justice, his vigor and firmness combined with uniform courtesy and kindness, and, yet more than any of these, that indefinable

but pervasive and potent influence which flows from a genuine and strong character, made him not only the presiding genius but the informing spirit of the institution not only a wise and efficient administrator but an inspiring ideal to every rightminded student.

As the head of the department of geology from the opening of the University, he occupied the field which was most congenial to his mind and in which he sought to do his chief and crowning work. He was untiring in enlarging and classifying its collections; and in their magnitude and their attractive and systematic arrangement they constitute a noble monument to his industry, his taste and his enthusiasm as well as to his scientific knowledge and skill.

But it was as a teacher that he rendered his most fruitful service to the University and to the world. In this function he stood pre-eminent. Inert indeed was the student who was not quickened by contact with his magnetic mind. Happy indeed was the earnest young life that felt the warmth of his spiritual touch. Hundreds of men and women, scattered now far and wide, hold him in reverence as the prophet who first woke them from their slumbers and gave them a true conception of what it is to think and live.

His services were by no means confined to the University. For many years he served as geologist of the state; and in this capacity and as a scientific expert he has contributed in an eminent degree to the development of its mineral resources and through these of all its industrial interests. His labors in this field as published in his able and valuable report have given him an international reputation as a man of science—a reputation which has reflected honor both on the state and on the University. He was alive also to the general interests of the

city and the country. Nothing human was foreign to him. The health of the community, its commercial affairs, its government, its moral and religious interests, all commanded a place in his thoughts and a share of his labor.

And yet, great as they have been, it is not for his service as President of the University, or as professor of geology, or as state geologist, or as man of science, that we owe him the deepest debt or pay him our deepest homage. It was as a man that he most deeply impressed us, and it was as a man that he rendered his largest services to mankind.

Who that has known him has not felt that here was a spirit of rare quality, a peculiarly gifted and great minded man? Who that remembers his vigorous and buoyant strength, the fullness of his gracious and generous wealth of endowment, does not feel his breast glow even yet with the virtue that went out of him?

But he is dead. His cordial greeting, his benign face, his venerable presence will be seen and known among us no more. We bow before the solemn fact in tearful sorrow. We pay him here our tribute of honor, of admiration, of love, of reverence. With the memory of what he was fresh in our minds, we may well say, as he himself said when we met with him on his seventieth birthday: "I have a growing respect and reverence for man. The spiritual difference between him and the rest of creation seems infinite. A being of such unmistakable alliance with Divinity as man, with the Godlike endowments of reason and conscience, may hope to emerge even from the shock of death unharmed."

Failure of Apple Crop.

The partial failure of the apple and other fruits this year has led to a great deal of discussion as to the cause or

causes. Some claim the damage was done by the severe cold wave of February while others claim, and have good arguments to support it, that it was done by the cold wave beginning on November 21 last in Nebraska and in three days extending to Ohio.

The region is practically 150 miles wide and extends from Nebraska to Ohio. In this belt in places the injury was great while to north and south it shaded off to nothingness. Out of the injured belt there was more snow, which was on the ground at time of the cold waves. The cold wave in November occurred immediately after a soaking rain which turned to sleet and snow, the temperature in a few hours sinking to nearly zero and hovering there for several days. The soil, water-soaked to a depth of from 8 to 10 inches, was frozen solid and remained frozen through the winter with the exception of a slight thaw in January.

An Iowa nurseryman states that owing to the lack of rain and frost before November the foliage was left on the trees so that their roots were thirsty. The drenching rain enabled them to gorge their cells with water and upon being frozen the cell walls were ruptured. To support this he says that upon examining the roots he found them black and dead, but that the tops were uninjured, and that in every case the damage was underground, hence the damage was not done by the dry severe cold of February but by the cold wave of November.

To further support his argument he says that on the evening when the rain turned to snow that the wind changed to the northwest and blew the snow off the north slopes and high lands into the valleys and on to the south slope. Thus the north slopes were injured while the valleys and south slopes were protected and were practically uninjured.

Those who favor the dry freezing theory also support their conclusions by the fact that there was little snow during the winter.

The reports of voluntary observers of the weather bureau, especially for Indiana and Illinois, indicate that the peach buds were killed early in the winter but nothing was said about apples being injured.

We know that if the temperature goes 15 degrees below zero that peach buds are injured but the apple withstands lower temperatures as the buds are much better protected. We lack definite information as to what temperature the apple can really withstand.

What makes the subject of interest is the fact that a single orchard in a locality has failed while other orchards in same locality are bearing heavily. There must be a cause for this somewhere. It may be the situation, the soil or many other conditions that we cannot think of.

Anyone having any ideas on this subject will confer a favor by writing to the Weather Bureau at Columbus, Ohio.

C. N. M.

Crude Petroleum as an Insecticide.

The use of petroleum in its refined form, or as we commonly know it kerosene, for insecticide purposes has increased rapidly as our knowledge of the methods of application has become better developed. Early experiments seemed to indicate that kerosene, while fatal to insect life, was at least equally fatal to vegetation and that it did not always pay to kill the plant for the sake of destroying the insect.

Experiments were then made in the direction of diluting the kerosene, having first emulsified the oil with some substance that would enable it to mix with water. Studies of this character were

made in connection with the work done under the United States Department of Agriculture or under the Entomological Commission resulting in the discovery that kerosene could be emulsified with either milk or soap suds. For many years the so-called "Riley-Hubbard" formula for producing a kerosene emulsion was the standard where the oil was to be used for insecticide purposes. Making an emulsion, however, was more or less troublesome, and many who attempted it failed, so that the material never became as popular as it deserved to be from its effectiveness. Yet later, the effort was made to produce an emulsion by mechanical means while pumping the kerosene and water from separate reservoirs by means of the same pump. The outcome of these experiments is the recent emulsion sprayer which is by no means perfected as yet; but has become satisfactorily useful in at least one of its forms. We do not now make an emulsion to begin with; but in the very act of spraying through a fine nozzle mix the small particles of oil and water and obtain in that way a mechanical mixture that has the practical effect of the old fashioned emulsion and does less injury to the plants with the same percentage of oil. Some two years ago it was also discovered that it was possible to use the kerosene undiluted upon plants with a reasonable degree of safety, provided certain climatic factors were sufficiently considered, and the application was made at the proper time and in the proper manner.

It is no part of my thesis to give a history of the kerosene insecticides and their usefulness, nor of their effect on plant life. I wish simply to call attention to the fact that we are still experimenting with this substance, and cannot yet be said to know all about it, either in its effect upon the insects or upon the plants.

Crude petroleum is even less known. Theoretically this material, which contains also the lighter oils that have been driven off in the manufacture of the kerosene, should be much more dangerous to plant life than the refined product, and when the suggestion was first made to me by a New Jersey farmer that crude petroleum would prove better than kerosene as an insecticide, I was inclined to pay very little attention to the matter. Yet at that time the San Jose or Pernicious scale had become so troublesome and in some localities so abundant as to threaten the life of certain kinds of fruit trees, that I concluded to make some experiments, using trees whose lease of life was estimated at a short period under the best circumstances. Even then so little faith did I have in the matter that I tried only a single tree, a Duchesse pear, painting it in the early part of January, 1898, from the tips of the twigs to the surface of the ground with ordinary commercial crude petroleum. I fully expected a dead tree; but much to my surprise when the proper period for it came along, the buds began to swell and the tree seemed if anything a trifle more healthy than others in the vicinity. The subject under experiment was horribly infested by the San Jose scale. Long before spring opened, it was found that the oil had made a thorough job of the scale; it had penetrated everywhere, into every crevice on the outside of the tree and to find a living scale was an absolute impossibility. Applied in that way, it was certainly the most complete possible remedy for this insect. Finding that the tree was making a start at least as well as its neighbors, something like a dozen other trees were sprayed after the buds were already pretty fairly developed, and had in some cases made a leaf growth. This time the oil was spray-

ed by means of a nozzle, so as to cover the trees as completely as possible. Some of the foliage was injured by this application and, where an extra heavy dose of the oil was applied, some blossom buds were also killed. The tree that was painted in January came out in full leaf, blossomed as satisfactorily as a tree in that condition could be expected to do and in due time brought its fruit to maturity. I watched this and the other oil-treated trees carefully throughout the entire season, and about midsummer it became apparent that something more had occurred than the mere killing of the insects. The tree treated in January was by all odds the best tree of its kind in the orchard, even where no scale infestation existed. Its rank, vigorous growth marked it at once in the row in which it stood, while the richness of the color of its foliage made it easy to identify as far as the tree could be seen. It was exactly as if a heavy dose of nitrate of soda had been added to the soil or as if the tree had been artificially stimulated in other ways. Up to the first of July and even for some time later, the surface of the bark was still oily and, although this tree was surrounded by others that were infested by the pernicious scale, not a scale set upon the wood that had been covered by the oil. Quite a number of insects came on from the outside upon the new shoots; but upon the wood that was in place in January when the treatment was made, not a scale set during the entire season of 1898. Crude oil does not evaporate rapidly. It seems to contain a certain amount of vasaline or substance of similar appearance, which remains upon the surface, while the lighter oils either evaporate or penetrate into the body of the tree.

Finding the indications were favorable, a considerable number of experiments were made with the oil during the sum-

mer of 1898, and in general with excellent results, indicating that the oil could be used under proper circumstances for a summer application, and that, while it would injure foliage to some extent, it did not seem to cause any injury to the bark or even tender shoots of apple and pear. During the winter of 1898-'99 much more extensive applications were made, and a much greater range of trees was experimented upon. In fact all the ordinary orchard trees were thoroughly treated with undiluted crude petroleum and not a single tree of any kind has been in the least injured by an application that was made.

I had under personal observation a series of trees that were set out in my garden in the spring of 1898, all of them young, therefore, and almost all of them more or less infested by the Pernicious scale; for the trees were selected more as subjects for experiment than as subjects for fruiting purposes.

Among others, three young peach trees were thoroughly painted with crude oil and these trees are now conspicuous in the garden among others of similar varieties by their vigor of growth and the healthfulness of their foliage. Given the same advantages so far as soil and treatment are concerned, no other trees even approach these in healthfulness of appearance. Plum and cherry trees were treated in exactly the same way; but the opportunity for comparison is lacking here, because no untreated trees were at hand for that purpose. All those that were treated with oil, however, are growing satisfactorily and there certainly has not been the slightest evidence of injury of any kind upon the trees. Two apple trees were painted or sprayed, and the application was made as thorough as possible in each case in order to test the effect.

upon a young tree of this kind. Both of these young trees are far ahead of any others anywhere about, and it goes almost without saying that on every one of these treated trees the scale is absolutely exterminated. I had among my material one sorry looking apple tree that had been treated with kerosene in the nursery row, because infested with scale. It had sustained a very bad attack of plant lice during its first season, and had been dosed with the mechanical mixture of kerosene and water and also with pure kerosene during the growing season, and I had marked it down as fated. This tree still had some life in February and this also I drenched with the crude petroleum. Much to my surprise the tree came out normally and while it is by no means a good tree even yet, it is more than the equal of two other trees out of the same lot which had had the same kerosene treatment but no application of crude oil. On better trees, the effect is almost equally marked and for some reason or other the effect of crude petroleum seems to be to enhance the vigor of growth in the tree, to give greater depth of color to the foliage and in all respects to increase or improve the appearance of the plant..

The tree that was treated in January, 1898, has been kept under observation during the present summer, and the difference between it and the surrounding trees is astounding. I have mentioned that it was a dwarf Duchesse; but it would hardly be recognized as a dwarf at the present time. The vigorous long shoots that were made during the summer of 1898 have been added to and supplemented by an equally vigorous growth in 1899, so that the tree is at present actually not only double in height but double in diameter what it was in the summer of 1897. There is absolutely no appearance

of injury or abnormality in any of this new growth, and the old wood seems to have improved in appearance and the tree increased in diameter in proper proportion. I was so well convinced of the usefulness of the crude oil as against the pernicious scale in the early winter of 1898-'99, that I advised its application on quite a variety of trees, and in several instances my advice was followed so that from two to three thousand trees at least have been treated with crude oil during the winter of 1898-'99, and therefore the experiments are, on a scale large enough to give us some right to judge. One marked case was in Burlington County, where there were three rows of large apple trees 30 to 40 years old, of good shape and good for several barrels of apples each year under ordinary circumstances. The whole of one of these three rows was thoroughly sprayed with crude oil during the winter and that row was in June a sight to behold as compared with the others. It looked almost as if it had received a heavy dressing of some fertilizer peculiarly adapted to the apple, or as if it were at least 5 years older and more vigorous than the rows on each side of it. The fruit was set full and fair and the color of the foliage was everything that could be desired. The rows on either side of it looked sickly in comparison though fully up to the ordinary condition of apple trees in that locality. This is the more surprising, because one would not expect as much effect upon an old tree from something in the nature of a stimulant as might be expected upon a young one that would respond more rapidly to an application of this kind.

On older peach trees I have not had the opportunity of making the same comparison. One orchard of about 500 trees was thoroughly sprayed with the oil

just before they were ready to start and all of these trees came out in good shape and what was rather unusual in that immediate vicinity, set full of fruit. There was nothing, however, with which to compare them close by, hence it was impossible to say whether the treated trees were better than they would have been had they been left untreated. It was possible, however, to say definitely that the peach trees could be treated with crude oil without in any way endangering the trees.

I do not wish to claim too much for this material, and I have tried to present facts rather than conclusions. What I cannot understand is the apparent stimulating effect upon the trees. The destruction of the scale insects will, of course, give the tree a new opportunity; but in some of the cases under observation, the scale insects were not sufficiently abundant to have any injurious effect upon the tree, while the seemingly beneficial effects of the oil were strikingly marked. The subject is one that merits further study and it is presented here as much in the nature of a suggestion to other members of this Association as a record of results obtained.—Before the Association for the Advancement of Science by John B. Smith.

Hydrophobia in Cattle.

On October 3rd we were called to a dairy farm about three miles out on the Westerville road, to see a cow which the owner thought to be suffering from indigestion. He informed us that he had been feeding sugar cane which had grown up with the corn and thought it quite likely that this was the cause of her indigestion. We found our patient, a small two years old Jersey heifer, down and unable to rise, being paralyzed behind. At first the symptoms seemed a little like milk fever

but the conditions of the animal as to pregnancy precluded that diagnosis. The symptoms were a little puzzling and we questioned owner closely as to history of the case. He stated that the first thing he noticed was her refusing to eat and the drying up of her milk. She seemed very wild and restless and he confined her in the barnyard away from the other cattle. She was very restless here, pawing and bellowing and whenever a chicken or the dog came near her she would rush at them, driving them from the yard. We suspected rabies and told the owner to notify us if he saw any of the other cattle showing the same symptoms. As the heifer was so far gone, we attempted no treatment, but requested to be notified of her death as we were anxious to hold a post mortem. We were notified of her death on the 5th, and held the post mortem twenty hours after the death of the animal. Nothing positive was revealed by the autopsy, other than that the brain was congested and there were indications that the animal had carried a high fever for several days. We removed the brain, took it to the hospital, procured two rabbits and innoculated them with some of the brain substance. On the following day we were called to the same farm to see another animal which owner said was showing exactly the same symptoms as the first. Our second patient resembled the first almost exactly, being of the same breed, size and age. We made a thorough examination of her and found pulse 55, respiration 15, temperature 101.5, all three being normal. She seemed very restless, expression was wild and staring, eye glassy and blood-shot. We could go freely into the pen where she was confined. She made no demonstration whatever toward us, but when we turned her into the barn yard she rushed furiously at the chickens, driv-

ing them out of the yard. When we attempted to restrain her she threw herself on the ground, tossed her head to one side and refused to rise until she caught sight of the family dog, when she sprang to her feet and drove him from the yard. A pumpkin rolled along in front of her excited her greatly. Holding a chicken just out of her reach greatly excited her also. She would make frantic attempts to get at it and tried to bite it when it was held in front of her face. We were positive of rabies at this time and told the owner so. We also questioned him closely as to whether he knew of a dog biting the cattle within the past few weeks. He recollected having seen a dog often, which had died about a month prior to then, snap at the cattle as they came up to the watering trough, which was very close to the house. The dog was sick at the time with what he thought to be distemper. He thought nothing of her snapping at the cattle as she had always been cross toward them. While sick the dog had shown no desire to attack any one of the family, and the afternoon before she died the owner had used her to hunt rats in the hay barn, noticing nothing wrong with her except that she was very weak and much emaciated. This confirmed our diagnosis. We secured the owner's permission to remove the heifer to the hospital, which we did on the 8th. We locked her in one of our large box stalls and observed her closely until she died. When we did not excite her she showed no violent symptoms whatever: only great restlessness and bellowing. A casual observer coming into the building and looking at her would never have suspected rabies and it is altogether probable that no veterinarian would have made a correct diagnosis without having a complete history of the

case. In fact there was an entire absence of what the laity suppose to be rabiform symptoms.

Her voice was much altered; a peculiar alteration that is difficult to describe, but which made quite an impression on those who heard it. She showed an abnormal appetite, eating the dirty bedding. She became much emaciated and very weak and died on the night of the 11th. A very careful post mortem was made, but other than the presence of foreign bodies in the stomach nothing unusual was found. Three rabbits were inoculated with the brain substance, as in the previous case on the 10th. We visited the same farm at owner's request to see a third case. The animal was a large five year old Jersey cow and as she seemed more inclined to be vicious than the others we ordered her shot. On the 14th another cow began showing the same symptoms and was killed by the owner who by this time was beginning to be alarmed. Being very conscientious he had notified his customers of the situation and abandoned his route rather than run any chances. He sold the remainder of his herd, some 15 or 20 excellent dairy cows, to a butcher. His action in this respect is very commendable and the financial loss sustained is very considerable. It will take a month or six weeks for the inoculation to affect the rabbits but results will be duly reported.

C. W. E.

Some Observations on Ohio Woodlands.

**By John F. Cunningham, Before the American Forestry Association,
Aug. 22, 1899.**

In the days of old, before our history began, when the eye of the savage sought out the spots and regions that were especially blessed by nature, one

of his favorite abiding places was the Ohio country, along the streams that formed the river called Beautiful. And why was the river called Beautiful, or in the language of the Red Man,—Ohio? Was it on account of the beauty of the stream itself or its environment? Was it because of the ruggedness of its banks or something else? Surely it was by reason of the beauty of the natural growth along the banks of the streams; and later the sturdy pioneer saw fit to apply the same name to the whole country now called Ohio,—in the words of the poet, “a wilderness sombre with forests.”

The land now occupied by the commonwealth of Ohio was at one time a mighty expanse of timbered country, within whose majestic solitudes the savage roamed in ecstasy and the stately animals of the forest lived and thrived. Could we have seen that mighty woodland in its grandeur we could well have understood why the original inhabitants, in their artful way, had called the great river and its surroundings,—“Beautiful.”

Ohio was originally a forest country. We are told that the pioneers who first took their way westward from the frontier of Pennsylvania, plunged into one mighty expanse of forest. It is true that the whole State was once one great forest with the possible exception of a comparatively small tract in the Northwestern corner.

Those pioneers, hardy men and women that they were, must needs have to put to cultivation that they might earn a livelihood. They could not raise crops in the forest, and thus the woods must be cleared away. To this immense task they at once set themselves and with such aggressiveness did they apply themselves that by the year 1853 a little more than fifty-five per cent of

the land was all that remained wooded.

It is easy to understand how these hardy people should come to hold a hatred for timber land. The men worked to fell the trees, clear the land, burn the brush and logs, prepare the land for crops, and harvest the crops from among the stumps, certainly found what hard-ship meant. Their sons who helped them, who from the time that they might be of any use in the woods had toiled from morning till night to clear the land for agricultural purposes, also conceived a natural enmity for trees and woods, and considered them a nuisance. This same spirit still exists in a greater or less degree, and it is especially evident when the action of the people is necessary to push any legislative action regarding forestry. “Get rid of the timber,” is the sentiment of too large a proportion of the people of the State, and to change this opinion can well be made the object of our scientific bodies, colleges, and press. The idea still prevails that all lands left to timber are just so much extra burden to the owner, and if this is true the sooner they are cleared the better.

Now, how is this? Let us see in a brief way whether the plan of having timber upon the farm ready to be drawn upon for the needs of the farmer is not a wise saving of time and money. There are a thousand ways in which timber is needed upon the farm, any one of which is likely to make itself known at any time. If a trip must be made to the lumber yard it means an expenditure of time and money, while if the timber is on hand ready to be used, this extra time and trouble will be saved. In buildings, frames, fences, rolling stock repairs, etc., especially cut timber of various kinds is often needed. If it must be especially cut and prepared by the dealer the expense soon becomes great,

while if it can be cut and prepared by the farmer himself and upon his own farm, he is independent and will save trouble and expense. Aside from the direct financial side of the question there are other reasons why each farm should have a woodlot of some size. In the first place the timber is a protection for property and livestock. Every one admits the value of standing timber as a protection from strong winds, and while it is not a good plan to use the woodlot for a pasture field, still the protection afforded by the trees extends far enough to be useful for some distance into a field adjoining.

Then the presence of woodland is always conducive to rural beauty, which item, even in a strictly commercial agricultural community, is not to be ignored.

We find in some authoritative statements upon forestry that the proper percentage of land to be in forests is from fifteen to twenty-five per cent. This percentage must no doubt be governed by the character of the country, the hilly lands demanding more of a forest cover than the level lands.

By taking the minimum amount, fifteen per cent, however, let us see how well our State has her forests distributed.

By referring to the chart we notice that in 1896 the percentage of woodlands for the State was about 17.8 per cent (a little more than our minimum, but which has probably been lowered since that time), but that in some of the counties the amount fell far short of this. At the time just mentioned thirteen counties had over twenty per cent in woodland, while seven counties had less than ten per cent. It is also interesting to note that not more than three of the counties possessing over twenty per cent of woodland could be classed as

"water-shed" counties, for the three rivers flowing southward through the State. It is in these rivers that the heavy floods of the past few years have been occurring.

Now while we admit that much of the increase of floods is due to the clearing away of the forests, at the same time we must allow that it is not all due to that one cause. The increase in agriculture, the improvement in drainage,—tile drainage, township ditches, etc., are all helps in getting the water out of, and off the land more quickly, thus swelling the rivers.

Referring to the chart again we will notice that during the period from 1853-1870, just about 17 per cent of the woodlands of the State were cleared. From 1870-1886, 16 per cent were cleared. From 1886-1896, 4 per cent were cleared, making a total of 37.6 per cent of the woodlands of the State of Ohio that have been cleared since 1853, and leaving in 1896, 17.4 per cent of the lands of the State in timber.

It will be seen at once by referring to Chart No. 2, that far too many of the counties of the State are short in the amount of timber land, taking 15 per cent as a standard. The counties colored blue are below the standard, and they number forty-three,—within one of being one-half the number of counties of the State.

In the States where the greatest activity in forestry exists, there are large tracts of land that can not well be devoted to any other purpose than raising trees. In Ohio no such areas exist. New York has a forest preserve in the Adirondacks of some 1100 square miles. In the report of the Commissioner of Forestry of Pennsylvania for 1895, the engineer member of the Forest Commission mentions six tracts that are recommended to be used as forest re-

serves, and containing from 200 to 300 square miles each. While Ohio may have some rough land that is unfit for agriculture there are no such tracts as this that have been surveyed with the intention of making forests. Even the lands that we have that would come in this class are not located so as to be of any value as river controllers. In the State of Ohio the stipulation that "to have a good forest you must have a large continuous area," could not well be heeded. Ohio is an agricultural State, and where once stood the continuous forest primeval are now the happy homes of prosperous farmers. The ancient forest has been broken up and where of old the wind swept through the majestic arms of oak, now the breezes fan the growing grain, and the peaceful herds of the modern dairyman.

With the advance that has been made in agriculture comes a preclusion of all possibility of having State forests of any great size, and in locations that will be of any other benefit than a place to grow timber.

The land is divided into small farms and the cultivation has become so intense that even a few trees here and there are not allowed to remain standing. What, then are we to do? Let us make a suggestion.

We have said before that the percentage of woodland should not fall below 15 per cent. Now, how better can this forest be proportioned than to have reserved upon every one hundred acres of farm land (and upon other farms accordingly), 15 acres of land for timber. To induce proprietors to put this plan into operation, let the land thus occupied be relieved from taxes.

This may sound like a flight of imagination, but something of the kind must be done for the welfare of the residents of the towns and cities of the State, as well as for the rural districts; and if for no other reason than regulating our water supply, in the name of the people let some action be taken.

Wheat Raising in Central Ohio.

(Continued from October Issue.)

Within recent years the application of fertilizers, either as manures or in the form of chemicals, has come to be a recognized necessity. More especially is this true of the territory from Indiana eastward. In Ohio the use of commercial fertilizers is practically universal, though there are limited districts where they have not been introduced. The problem simply solves itself into this: Something must be added to the soil if a crop is to be removed. It is impossible to secure sufficient barnyard manure, and clover is onesided, hence commercial fertilizers are the only alternative. Wheat seems to be the crop to which they may be added with the greatest ease and success. The addition of about 200 pounds per acre of commercial fertilizer has proved to be both beneficial and profitable. It may be asked whether a complete or an incomplete fertilizer should be applied.

By a complete fertilizer we mean one containing nitrogen (commonly rated in trade as ammonia), potash and phosphoric acid. Every soil does not need all three of these elements; some need but one of them. The only safe means of determining this is by experimenting in the field. However, a few general suggestions may be made. There are very few soils that would not be benefited by the addition of phosphoric acid. The heavier clay soils are in the main not deficient in potash, while black loams usually contain a sufficient quantity of nitrogen. Phosphates are the cheaper of the three. Twelve to sixteen per cent goods can be purchased in the retail market at \$16 per ton. On the other hand ammoniated goods are the most expensive, hence it is highly important that the farmer make use of the cheapest

source of this element,—the clover plant. A somewhat exaggerated opinion is prevalent in many parts regarding its fertilizing value. All that it can possibly add is nitrogen. This it does by means of the tubercles on its roots. It does, however, afford a greater feeding ground for shallow rooted crops. It brings up from below valuable fertilizing elements. But it does not (in any sense) add them to the soil. Its mechanical effects are also invaluable. Its large roots open up the soil and allow a more free circulation of air, thus rendering available some of the stored fertilizing elements of the soil. They also add large amounts of vegetable matter which add to the porosity of the soil.

As to the culture necessary it appears to be the universal opinion that a seed-bed compact below, with a slight mulch of pulverized soil on the surface is the ideal one. This is true from the fact that a porous soil absorbs more water and hence will be more affected by freezing and thawing, which means death to the young wheat plant. Also a compact soil retains moisture in a dry season much better than does a more open one, and the pulverized soil on the surface prevents its escape by obstructing capillary action.

My own observation has led me to conclude that the only two implements needed for the best and most economic wheat seeding in corn ground are the disc harrow and disc drill. Especially is this true if there are many weeds present.

The time of seeding must be governed in great measure by the season. Freedom from the ravages of the Hessian fly is better insured after one or two good frosts. About the 15th to the 25th of September I should say was the best period for Central Ohio.

E. O. FIPPIN.

Grass Insects.

When we consider the extent of the dairy and stock industry and the amount of acreage in pastures and meadows it is very easy to realize the enormous importance of the grass crop and I think no argument is necessary to show that insect injuries to these crops are of vital concern to the state at large. Moreover, I am convinced that the actual aggregate loss from insects is much greater upon the various grass crops than upon any other single crop in stock-raising districts. This damage, however, is of such a nature that it is very difficult to estimate it precisely and to convince an ordinary observer of its actual occurrence. The different kinds of insects affecting the grass crops for the most part work in such manner as to not kill the plants outright but simply to lessen the vitality of the crop and to devour a certain portion of it in some manner as the stock pastured upon grass consume a portion only and leave the plant to grow. We have, working in this manner, a host of grass hoppers, which feed upon the leaves of the grass, cutting them off above the ground and devouring a portion and doubtless allowing much to fall to the ground to dry up, and this loss cannot be noticed any more than to observe a shortening of the blades when the pasturage is stopped. If we recognize that we are pasturing thousands of grass hoppers on each acre of land we can perhaps appreciate that if these creatures were not pastured, a larger number of animals might be fed upon the same land. Along with these, but working it quite different manner, are innumerable leaf hoppers, which puncture the leaves and pump the juice thus producing the wilted spots in the leaves, checking the growth of the plant and reducing the food supply for stock. Some careful estimates of the number of these leaf

hoppers have shown that they may occur in numbers approaching at least a million to the acre. The amount of nutriment used by them must certainly be no small item. Again, there are many species of cut worms which are constant residents of pasture and grass land, which remain hidden near the surface of the ground during the day time but which feed upon the leaves of the plant cutting them off slightly above the ground and thus wasting quantities of vegetation that are not devoured. Similar to these are the species of sod worms, which in some years are so abundant as to produce very decided barren patches in pastures even at times when the rain fall has been thoroughly abundant. Further down in the soil we may find plant lice, white grubs and other pests which attack the roots of the plants and in this manner affect their vitality, decreasing the rate of growth of foliage and consequently must seriously impair the value of pasture or of meadow land. It is easy to see that while these insects may be discovered and their habits worked out, that the determination of positive means of destroying them are somewhat difficult. For many of these we have as yet no satisfactory means of treatment but for others there are measures which may be used to advantage.

In general it may be said that root-infesting species are protected from direct attack in the destructive stages. While it has been shown that such larvae may be destroyed by the use of kerosene emulsion, such applications in quantities sufficient to destroy the larvae beneath the surface of the ground would not be considered of general practicability. Many of these species, however, may be attacked at other stages. *Nocutids* and *Pyralids* are attracted by lights, and some of them certainly prior

to egg laying, so that for certain species trap lights may be recommended. *Elateridae* may be destroyed in the adult stage by the use of arsenical baits; *Lachnosterna* may to some extent be affected by spraying the trees with arsenical solution, and some of the root-infesting *Aphids* by the destruction of their spring generations on woody plants. For the species feeding upon the stems, leaves, and seeds of plants, applications must depend upon the insect and the nature of its attack. In some cases, we believe a broadcast spraying of the arsenites for leaf-feeding species and of kerosene emulsion for suctorial species might be applied with profit. For grass hoppers and leaf hoppers the use of the tar pan, a method which has proven very successful, may be recommended. This process is perhaps worthy of most extended recommendation, and there can scarcely be a doubt that its general adoption upon pasture and meadow lands would result in great profit. It is also quite certain that for many species eggs are laid in the grass in autumn, and late fall or early spring burning will prove of great advantage if conditions permit adoption of this plan.

In the most general way, therefore, we may recommend:

First. A general rotation of crops, especially for clover and for meadows generally, and change at the end of four or five years at the most.

Second. Whenever it is desirable to keep the same field continually in grass for a long series of years, as in rough land or woodland pastures, attention to the maintenance of trap lights, the use of arsenical baits or applications, burning, and the tar pan should be practiced, especially after the second year.

Third. To allow ground squirrels, moles and other natural enemies to carry on their work unmolested, and in case

their multiplication affects surrounding crops to adopt means to protect such crops without destroying these animals. If in localities where fertilizers may be used with profit, to adopt the use of such kinds as may have insecticidal properties.

HERBERT OSBORN.

Book Reviews.

"The Insect World," by Dr. Clarence M. Weed, cloth; 16 mo; pp 210. D. Appleton Co., New York. Price 60 cents. A new and valuable addition to the Appleton home reading books, under the division of natural history. The book is a compilation of a series of articles chosen from the entomological literature which seem especially adapted to interest and instruct in the habits and life history of insects. It is thoroughly well written in a popular and fascinating style making each succeeding chapter of increasing interest. While all statements are accurate scientifically the subjects are treated in a non-technical style which appeals at once to the non-professional and those just beginning the study of zoology. It is intended not as a text book but as a supplementary reading which will guide and stimulate the reader to original observation and research.

Neatly and attractively bound, clearly printed and well illustrated with accurate drawings, it is a book meriting a place in every home and general library.

"Keeping Cows For Profit" is the well chosen title of the newest work on practical dairying to come under our notice. We understand that a large issue of this little publication is being gratuitously circulated with the compliments of The De Laval Separator Co., 74 Cortland St, New York, which concern offers to send a copy to every reader of the AGRICULTURAL STUDENT upon request.

The book treats of dairying as a manufacturing business and discusses its problems from the standpoint that every dairy farmer is just as much a business man as though engaged in any other manufacturing or commercial undertaking. It is compiled in terse, practical manner, is easily readable, and can hardly fail to be interesting and instructive to every one in any way concerned in dairying. It is splendidly printed, handsomely illustrated, and altogether pleasing. The front cover shows a lithographed milking scene, and the back cover a cut of the Jersey cow, Ida Marigold, which received first prize at the Chicago Exposition..

The book begins with a brief review of the history of dairying, shows the relative percentage of the various component parts of the different dairying products, takes up the production and marketing of such products in one form after another, and closes with a pertinent reference to private dairying.

In an historical and statistical way it tells much that is interesting. We learn that dairying is of most ancient beginning, going back at least 2000 years before Christ, but that in a commercial form it is most modern, being scarcely more than the development of the last generation. We learn that in 1898 the dairy products of the United States were \$500,000,000; that there are some 17,000,000 milch cows in the United States; an annual consumption of 1,750,000,000 gallons of milk; 1,500,000,000 lbs. of butter and 300,000,000 lbs. of cheese; and that 1899 prices of all dairying products, especially butter, have been considerably higher than for several years past.

We find that the average United States yield of milk per cow is less than 4,000 lbs. a year, and only about 130 lbs. of butter; while to be profitable the milk yield

should be from 5,000 to 6,000 lbs., and the butter production never under 200 lbs. In this connection it is authoritatively stated that fully one-half of the butter produced in farm butter making, by the practice of the older dairying methods, is made and marketed at an actual loss to the maker.

The book fairly teems with practical facts and epigrammatical expressions appealing to the dairy farmer, in every phase of his work from the selection and care of his herd to the manufacture and marketing of the finished product.

One of the most interesting chapters is that devoted to skim-milk, of which the use of the centrifugal cream separator has made a new by-product in dairying, with a much wider field of usefulness than was either thought of or possible in the practice of gravity setting.

While the purpose of its distribution is no doubt an advertising one, in a considerable degree, there is much that is commendable in the little book, and we think it bears out the introductory statement that it is dedicated to every owner of a cow in the hope that it may afford some beneficial hint or suggestion to all who may take the trouble to look over its pages.

Literary Note.

The College Man's Number of The Saturday Evening Post (of Philadelphia) though planned primarily to appeal to university men, past and present, will interest all who care for the short story at its best. Robert W. Chambers, in "The Spirit of the North," tells of the adventures of a party of Columbia naturalists and their quest of the dingue—hitherto supposed to be extinct—in the unknown country behind the Hudson Mountains. This story is a rather remarkable combination of exciting action and inimitable

humor. Charles Macomb Flandrau (author of Harvard Episodes) contributes "Prince Protococoff and the Press Club," an irresistably funny episode of Cambridge life. Jesse Lynch Williams (author of Princeton Stories and The Stolen Story) chronicles "The Great College-Circus Fight" between Princeton students and a passing Wild-West Show; and Arthur Hobson Quinn (author of Pennsylvania Stories) tells the story of "The Last Five Yards."

Among other contributors to the number are President Benjamin Ide Wheeler, who discusses the regulation of college athletics; Thomas Wentworth Higginson, who describes the college life of our grandfathers, and President Nathaniel Butler, of Colby College.

The College Man's Number will be on all news stands after October 26.

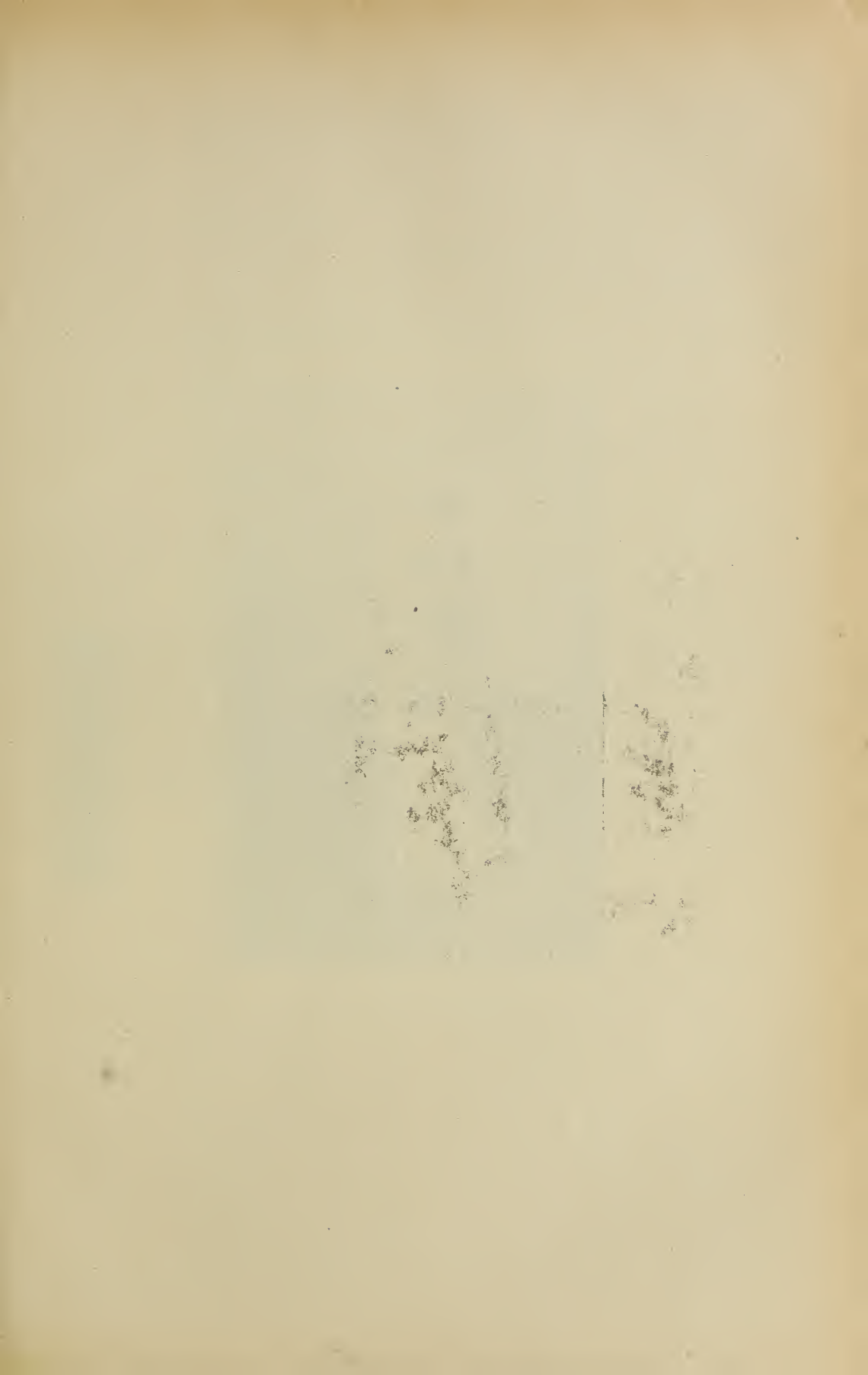
"The farmer, who deals so exclusively with nature in her various moods, must ever remember that he cannot originate, but only turn to good account, the results of thoughtful observations and studied experiences."

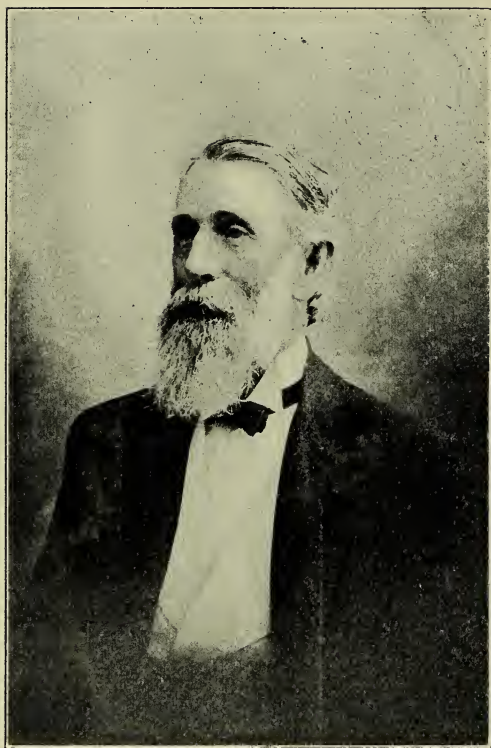
"In many places where the farmers have built and maintained the roads for nearly a hundred years, the highways are no better and no worse than they were a century ago."

"The man who boasted of taking a bath once a year whether he needs it or not, was a brother to the wise men who repair their roads on the same principle. The time to repair a road is when it needs it."

"A community is not likely to get rich while its roads are poor."

"Good roads arouse pride and stimulate other improvements."





PROFESSOR ISAAC P. ROBERTS.

Cornell University.

[See Page 71.]